



Repurposing of Existing Technologies for Custom Design Solutions

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Overview



- Design Background
- Design Approach
- Three Professional Examples
 - Dual Seal Shutoff Valve
 - Peristaltic Pump
 - Live Loaded Valves
- Summary



Design Background

- Georgia Institute of Technology Prototype Machine Shop
- Parker Hannifin Corporation Instrumentation Product Division (New Product Development)
 - Company with vast resources and multiple divisions.
 - Great opportunity to leverage one division's technologies for custom purposes.
 - Quick Disconnect Cap for air sampling.
- Mechanical Structural Design Branch at MSFC supporting the UPA.
 - Proto Flight System



Design Approach

- Three expectations: (Are only two out of the three are achievable?)
 - On Time
 - Within Budget
 - Quality, i.e, the design works well the first time with minimal design changes needed
- All three are likely achievable in “practical” engineering with a design philosophy of repurposing existing technologies for the custom design solution.
- Use upfront design time researching existing core technologies that may work in the design application.
 - Getting this right shortens design life and cost while putting the design in a better position to meet performance or “quality” requirements.
- Critical to know specific requirements of Design to ensure this repurposing will be successful.

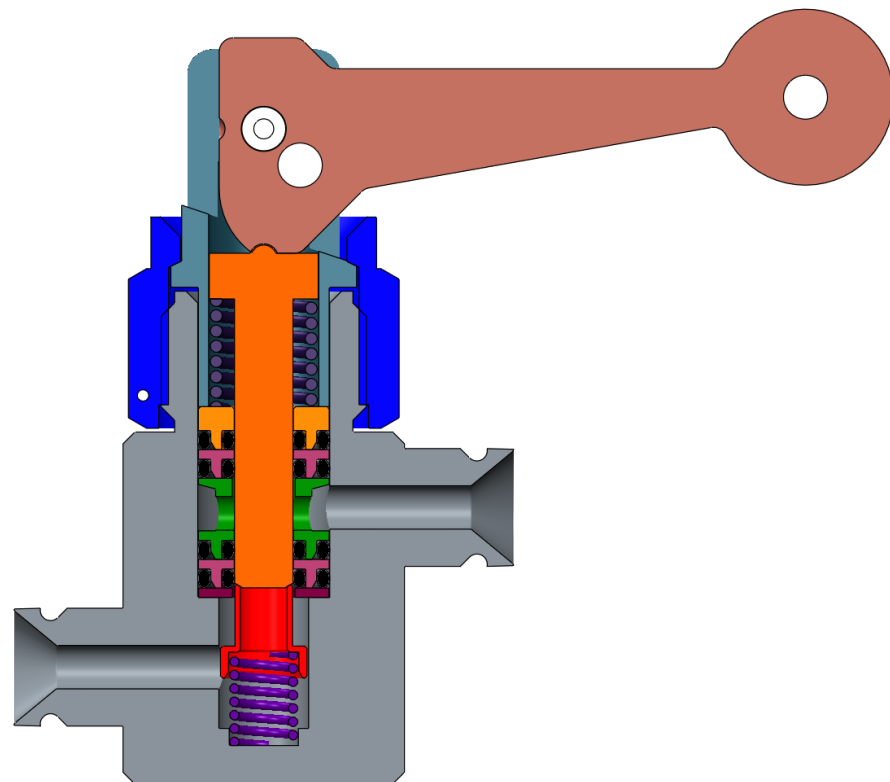
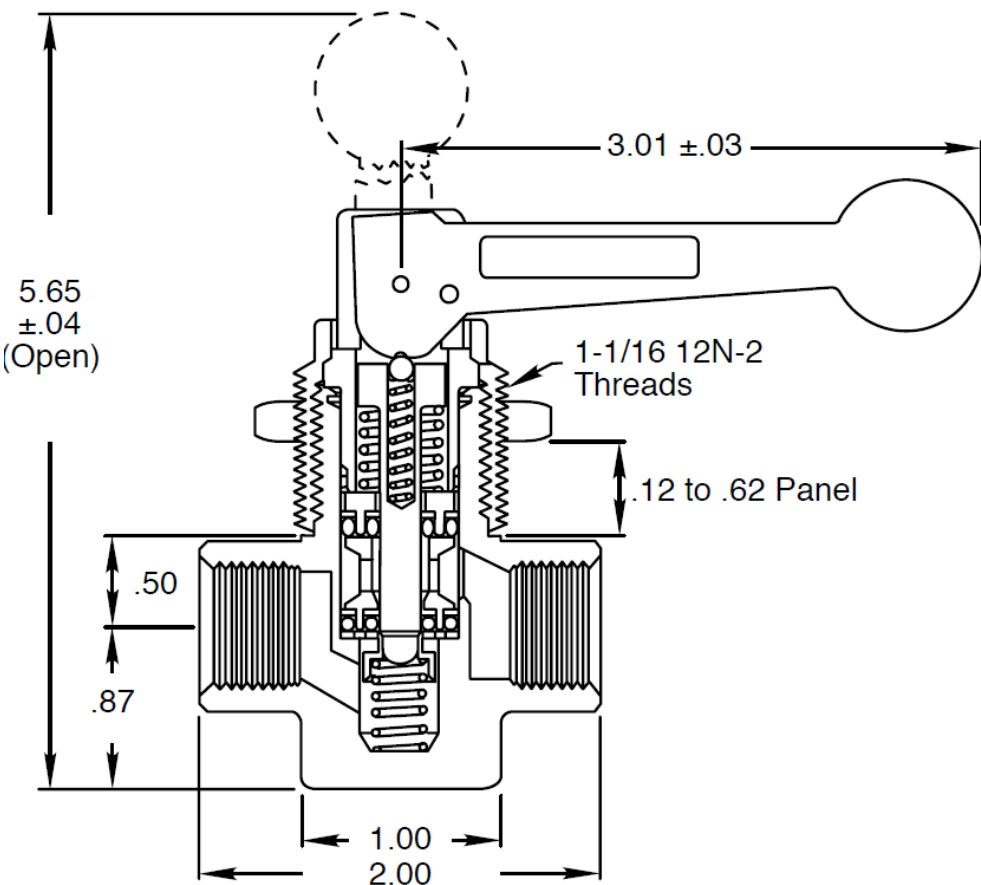


Dual Seal Shutoff Valve

- Develop, build and certify condensate sampling port to be located at the Water Recovery System (WRS) 2 Rack Utility Interface Panel (UIP)
- New Sample Port design and location to be advantageous over existing hardware:
 - WRS2 RIP volume provides easier crew access(easier to schedule).
 - Eliminates hardware needed for sample which reduces time for set up and teardown.
 - 1 Crew member saving substantial time over current sampling method.
 - Reduces purge volume.
 - Less crew time required to purge dead leg.
 - Will not require a separate 1 liter bag for purge volume.
 - Eliminates reclaiming purge bags(saves 4 bags/ year).



Dual Seal Shutoff Valve

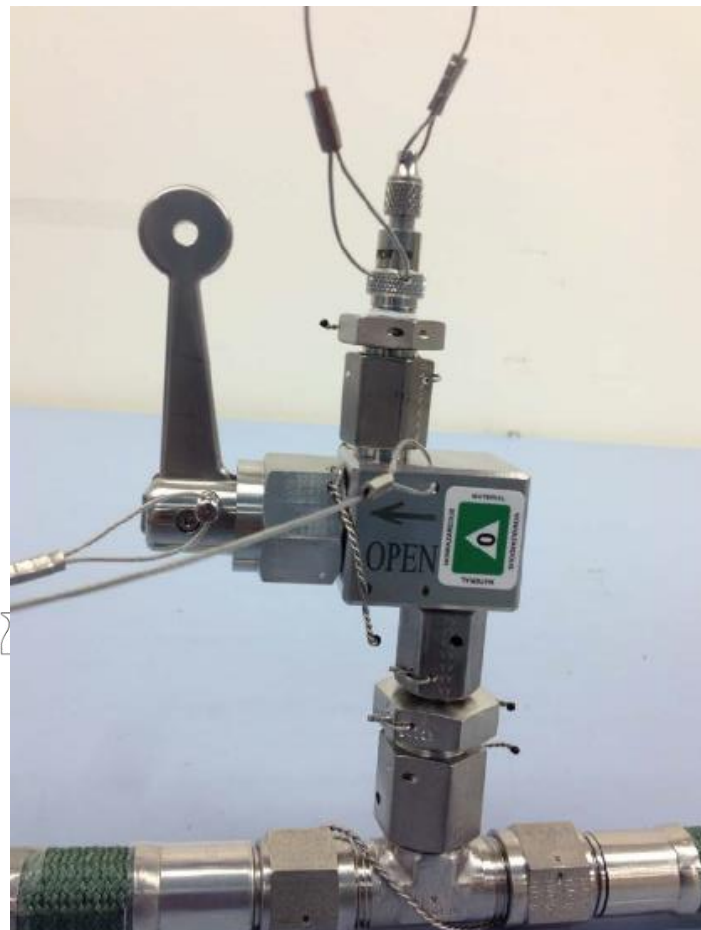
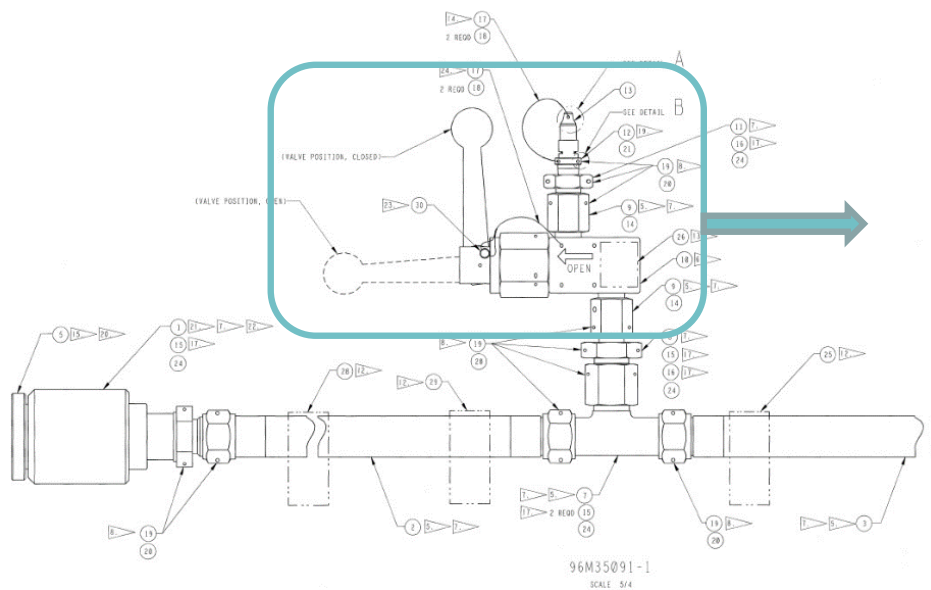


Manual Shutoff Valve, URL: http://www.circle-seal.com/products/shutoff_valves/csc-msv_0506_lo.pdf

Custom Derived Manual Shutoff Valve



Dual Seal Shutoff Valve

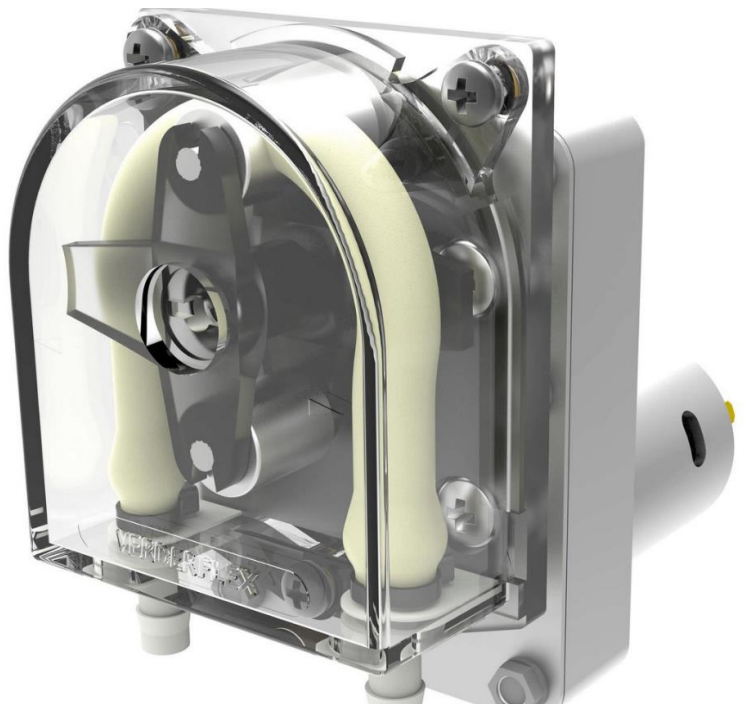


Final Custom Shutoff Valve Assembly



Peristaltic Pump

- Develop, build and certify a pump for transfer of various fluids from one location to another in support of the water recovery system.
- Requirements for design lead to peristaltic pump option.



Peristaltic Pump Head, URL:

<http://www.directindustry.com/prod/verderflex-peristaltic-pumps-14215.html#product->

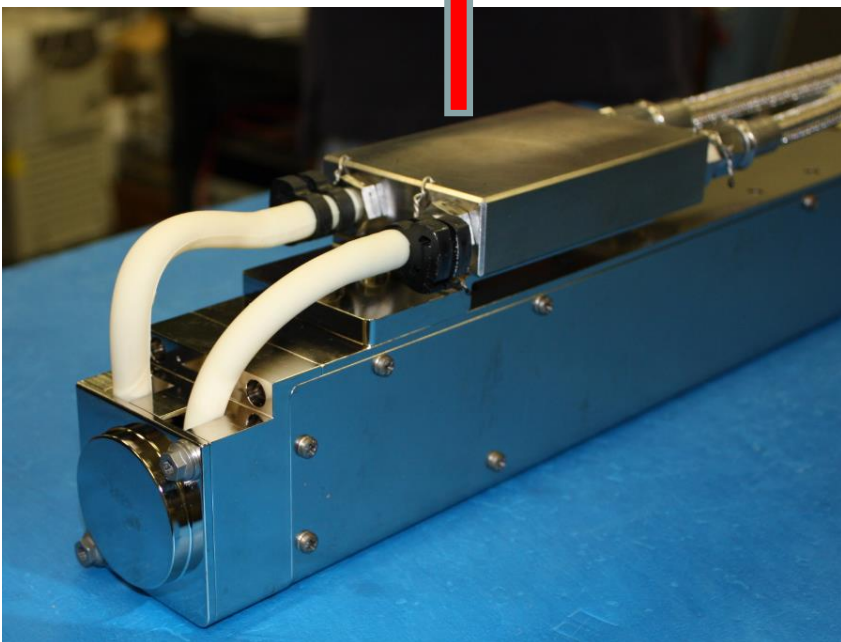
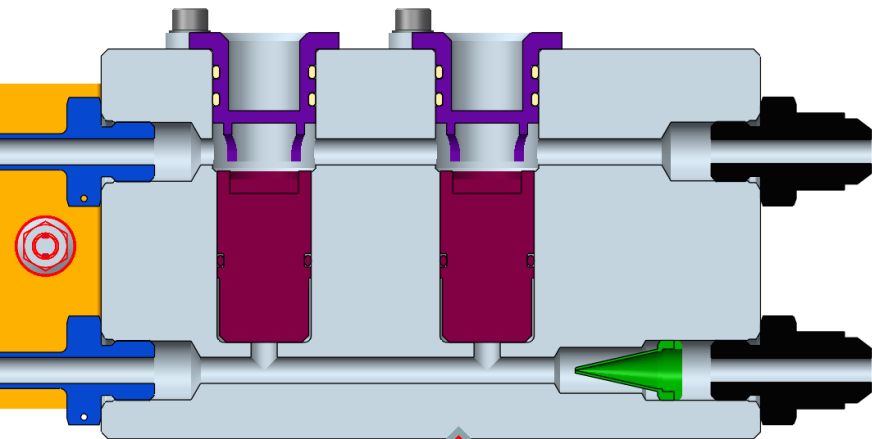
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Custom Derived Peristaltic Pump Assembly

JACOBS
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Peristaltic Pump



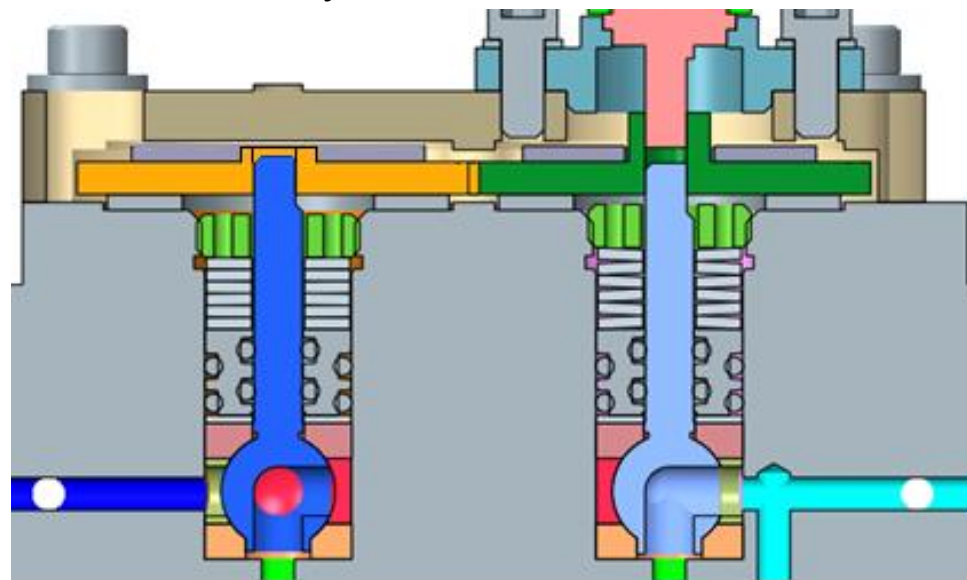
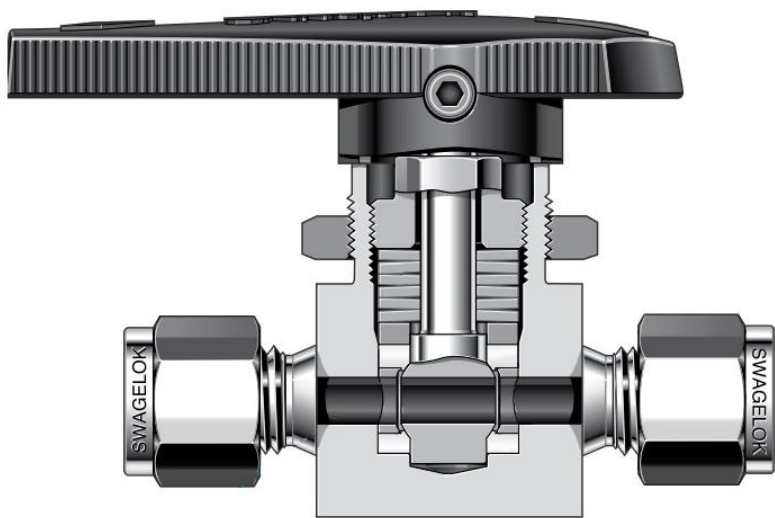
Station Pump Assembly





Live Loaded Ball Valves

- Redesign ball valve assembly to prevent leakage during final environmental testing prior to shipment to the International Space Station (ISS).
 - Teflon packing cold flowing during elevated temperature testing creating loss of the sealing contact stress.
 - Need to maintain proper sealing contact stress through testing and life of valve without any manual adjustments on valve assembly.



Swagelok Ball Valve, URL:
<https://www.swagelok.com/downloads/webcatalogs/en/MS-02-331.pdf>

Custom Derived Live Loaded Ball Valves



Summary

- Very unlikely any of the aforementioned design solutions would have been as easily approved in design reviews with management if existing core technology was not being implemented.
 - Without the existing core technology there would have been uncertainty in a successful completion, budget, and on-time delivery.
- Repurposing existing technologies can be an effective design approach to meet all technical requirements, budget constraints, and schedule demands.
- This design philosophy should be a cognizant upfront approach for coming up with a solution to the problem.
 - Need to have much of an understanding of the requirements as possible to ensure existing technology will work.
 - Core technology should remain intact during the repurpose in order to provide the confidence to all parties involved that the design will be successful.
- Exposure to existing technologies can add to experience and make it easier to do the upfront research and narrow down possible areas to draw from.
 - Always be a student.